geared turbines, the propeller, shafting, and boilers remaining the same. On again testing for economy a gain of 15 per cent. was shown over the original machinery, and subsequent minor alterations have increased this gain to 22 per cent. There are two turbines, a high pressure and a low pressure, each driving a pinion at 1400 revolutions, gearing into a main wheel on the screw shaft making 70 revolutions per minute. The gearing is entirely enclosed in a casing, and is continually sprayed with oil by a pump. Ordinary centrifugal governors on the turbines control the speed, and because of the enormous angular momentum of turbines (some fifty times that of an ordinary marine engine) the acceleration is so slow that the governors have time to act, and consequently no racing has ever occurred in the heaviest weather, and it is certain that if geared turbines come into use there will be no more cases of broken screw shafting as has hitherto been common with reciprocating engines.

The vessel has now been carrying coal from the Tyne to Rotterdam for about a year, and has covered about 20,000 miles and carried 90,000 tons of coal across the North Sea. The pinion on the lecture table was specially removed from the vessel last week for this lecture, and shows a wear on the teeth of under 2/1000″ in this time, and its life will therefore be equal to or greater than that of a vessel.

Gearing promises to play an important part in war vessels for increasing the economy at cruising speeds. We explained the difficulty in obtaining good economy at the high-pressure end of marine turbines, and in replacing such portions by geared high-speed turbines we have a complete solution. The Turbinia Company are now constructing two 30-knot destroyers of 15,000 horse-power, wherein the high-pressure portion and cruising elements are geared in the ratio of 3 to 1 and 5 to 1 respectively to the main low-pressure, direct-coupled turbine. Their use will increase the radius of action of the vessels at cruising speed to a very considerable extent over that of any similar destroyer without gearing. Similar gearing is proposed for warships, with similar prospective advantages.

Gearing may also find a place in cross-Channel boats and liners for the high-pressure portion of their turbines, but the greatest material gain will be in extending the use of turbines to vessels of slow speed.

Gearing enables very high coefficients to be used in marine work at full speed, and good coefficients at all speeds without much increase in weight, and under such conditions a geared high-speed reaction turbine is much more efficient at the high-pressure end than the multiple impulse wheel or wheels we have considered, and will probably dispense with their use generally. Gearing in marine and land work promises to give to the turbine a level consumption curve like that of the gas and oil engine. Half a century ago nearly all screw vessels had mechanical gearing, one element being composed of wooden teeth, for gearing up the speed of the engine. Subsequently the speed of engines was increased, and gearing abandoned. Now a very slow-speed turbine is an impossibility, and accurately cut steel gearing seems to be a permanent and satisfactory solution.

Low-pressure turbines worked by the exhaust steam from other engines are coming into general use on land under the name of "The utilisation of exhaust steam," for they utilise what was formerly a waste product, the exhaust steam from non-condensing engines.

They are generally employed in the generation of electricity or in the working of blast-furnace blowers and centrifugal pumps and gas forcers, but recently an exhaust turbine of 750 horse-power has been applied to driving an iron plate mill in Scotland. The turbine revolves at 2000 revolutions per minute, and by a double reduction of helical gears drives the mill at 70 revolutions. A flywheel of 100 tons weight revolving at the same speed as the rolls equalises the speed. During each rolling the turbine and flywheel collectively exert 4000 horse-power, the maximum deceleration at the end of each roll being only 7 per cent.

So satisfactory has gearing proved up to the present on a small and also comparatively large scale that it seems probable that by its use turbines will be more widely adopted in the future for power purposes generally.

There are at the present time just above 6,000,000 horse-power of marine turbines completed and building, and also an equal horse-power of land turbines of the compound reaction type.

AUSTRALASIAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

THE Australasian Association for the Advancement of Science held its thirteenth meeting at the Sydney University on January 9–14 inclusive. In a short article in our issue of February 23 last (vol. lxxxv., p. 558) a brief outline of the proceedings at the meeting was given. We have now received from Mr. J. H. Maiden, the permanent honorary secretary of the association, an extended account of the meetings and presidential addresses delivered in the various sections, and are glad to publish a fuller report of what proved an important and successful gathering of Australasian men of science and their friends.

The president for the year, Prof. Orme Masson, F.R.S., professor of chemistry in the University of Melbourne, presided over the meeting, which was attended by more than 500 members, the membership being above 800. Every State in the Commonwealth was represented, and also the Dominion of New Zealand.

The president gave a garden-party in the afternoon of January 9, and delivered his address in the evening in the Great Hall of the university. His Excellency the Governor, Lord Chelmsford, was in the chair.

The work of the meeting was divided among eleven main sections, each with its own president, vice-president, and secretary. The following is a list of sections with the name of the presidents:—

Section A, Astronomy, Mathematics, and Physics: Prof. T. H. Laby, professor of physics in Victoria College, Wellington, N.Z. Section B, Chemistry, Metallurgy, and Mineralogy: Prof. B. D. Steele, professor of chemistry in the University of Queensland, Brisbane. Section C, Geology: Prof. P. Marshall, professor of geology in the University of Otago, Dunedin, N.Z. Section D, Biology: Mr. F. M. Bailey, Government botanist at Brisbane. Section E, Geography and History: Prof. G. C. Henderson, professor of history in the University of Adelaide. Section F, Anthropology and Philology: Mr. Edward Tregear. Section G—two departments, (1) Social and Statistical Science: Mr. E. W. H. Fowles; (2) Agriculture: Prof. W. Angus, late director of agriculture in Adelaide. Section H, Engineering and Architecture: Mr. Ellwood Mead. Section I, Sanitary Science and Hygiene: Dr. W. Perrin Norris, Commonwealth Director of Quarantine, Melbourne. Section J, Mental Science and Education: the Rev. E. H. Sugden.

Prof. Masson spoke first of the earliest attempts to bring about a visit of the British Association to Australia. In 1909 the matter was brought under the notice of the Australasian Association, of the universities and scientific societies of Australia, and of the Federal and States Governments. All united in cordial support of the proposal, and old financial difficulties were dispelled by the far-sighted generosity of the political rulers. The Government of the Commonwealth, acting officially for all Australia, sent a formal invitation, which was unanimously accepted by the British Association for the year 1914. Prof. Masson said it was his good fortune to attend the Sheffield meeting last September, and to speak there with the High Commissioner as the inviting deputation; and he bore testimony to the hearty feeling that prevailed and to the strong desire shown by many of Britain's most distinguished men of science to profit by this opportunity of seeing Australia, to study its science on the spot, and to play a part in what will surely prove a great event in the history of imperial unity.

He went on to describe recent advances in chemistry. He dealt first with the atomic theory, and proceeded to explain with great clearness ionic dissociation, conductivity through gases, molecular collision, the periodic law, radioactivity, and the transmutation of metals. Towards the end of his address he referred to the theory of the spontaneous transformations of the atom, whereby new kinds of atom, both electrical and material, are produced, some of the latter having but a short life before they in turn

undergo spontaneous disruption like their parents. Recent as this theory of successive atomic transformation is, it may be regarded as proved; proved by mathematical analysis and quantitative observations, proved by its explanation of a host of related phenomena, proved by its successful predictions of previously unknown facts. Perhaps the most interesting thing about it is that it confirms and tends to complete the old atomic theory. The transmutation of elements is proved at last, but man has not learned to cause it; he has only learned that it has been going on in nature since the beginning. Perhaps, in utilising the intense energy of the natural radio-active transformations of radium, or its emanation, we may succeed in influencing the life-history of other, more sluggish, atoms, and thus hasten transmutations which would otherwise be so slow as to escape our observation altogether. Ramsay has done some work in this direction, and has got some curious and interesting results, but it is too early to speak with certainty of their meaning. One extension of the disintegration theory, however, seems unavoidable. The power of spontaneous disruption, involving the creation of new atoms out of old, can hardly be the exclusive property of uranium, radium, thorium, and a few other elements of large atomic weight; it must rather be an inherent property of atoms generally.

The president closed with a few remarks of local interest. "The great advances that I have sketched," he said, "are, of course, attributable in the main to European workers. Yet we may, I think, take some satisfaction in the fact that teachers and students of the universities in this part of the world, or graduates who have gone home from here, have contributed somewhat from time to time. These Australasian contributions include work on the general theory of solution, on the mobilities of ions, on electrode potentials, on conductivity in aqueous and other solutions, on the dynamics of chemical change, on gaseous ions, and on radio-active phenomena. The older universities of Australasia are growing, and new ones are arising, as in Brisbane and Perth. Naturally and inevitably there is a tendency nowadays to ask of universities a greatly increased attention to more utilitarian developments of science. It is so in England, where, for instance, the University of Sheffield devotes a great department to the metallurgy of iron and that of Leeds cultivates its schools of textile fabrics, dyeing, and domestic economy. It is so in Australia, where there is a steady pressure put upon the universities to develop increasingly on the lines of technical schools. All this is, doubtless, as it must be; but it is beset with a certain danger. The risk is that the whole energies of these institutions, where teachers are always too few, and equipment is never too plentiful, will be directed towards the useful applications of science, and science itself will be neglected. This, if it occurs, will be a pitiful result, and will not tend to raise Australia among the intellectual countries of the world. Let us be a practical people and have due regard to utility; but let us also have some means and leisure to cultivate the vastly more interesting inutilities, for thus only can we hope to increase Australasia's contribution to the true advancement of science."

The evening lectures were two in number, one on January 10, by Prof. G. C. Henderson, professor of history in the University of Adelaide, who chose for his subject the "Mutation Theory of Evolution in History." The lecturer said that from 1870 onwards evolutionary philosophy has pervaded all departments of intellectual activity, and has stimulated patient and painstaking research in all directions. Physical evolution, or evolution in the organic world, was one thing; psychical evolution, or evolution of human life and affairs, was another and very different thing. He wished, he said, to state plainly that they could not apply the current theories of organic evolution to the history of any race of human beings. Few people would care to deny that the champions of the organic theory of evolution had rendered invaluable service, not only to science, but even to religion. They had challenged and laid low many a doctrine that was little better than a superstition; they had forced religious men to discriminate more carefully between what is metaphorically and what is literally true; and they had converted many an ignorant dogmatist into an earnest and reasonable seeker after truth. But it must not be imagined that victory had been all on one side. By no means. The evidence of poetry, history, philosophy, and reasoning religion was stronger than it ever was in support of the essential differences between organic and human life. It would appear from recent pronouncements that some of the leading thinkers in the medical and biological professions are disposed to reckon with the influence of mind over body more frankly and fully than they had done hitherto.

The evening lecture on January 12 was by Prof. P. Marshall, of Dunedin, professor of geology in the University of New Zealand, who chose for his subject, "Glaciers of the Southern Alps," which was illustrated by some of the most remarkably beautiful slides that have ever been produced of a wonderful region.

The evening of January 13 was devoted to a combined conversazione given by the association and the Royal Society of New South Wales in the Great Hall of the University, when a number of exhibits were shown in the hall itself, and, in addition, the laboratories of the engineering, biological, and physics schools were thrown open. Prof. J. T. Laby exhibited a fine model of the Brennan mono-rail. During the evening the Mueller memorial medal, "for researches in natural science," was presented by the President (Prof. Masson) to Mr. Robert Etheridge, curator of the Australian Museum, in recognition of his researches in palæontology and Australian ethnography.

The following extracts from the presidential addresses in the various sections will give some idea of the wide scope of the meeting.

In Section A, Prof. Laby discoursed on "Recent Advances in Physics." It is rather interesting to find, said Prof. Laby, that physicists trained in the Australasian universities are advancing science in all parts of the world. Most of the theories and discoveries in radio-activity we owe to Prof. Rutherford (Christchurch); new views as to the conduction of electricity through gases to Prof. Wellisch (Sydney); important contributions to the theory of light by President Maclaurin (Auckland); many and varied researches in ionisation to Dr. Kleeman (Adelaide); the organisation of metallurgical research at the National Physical Laboratory, London, to Dr. Rosenhain (Melbourne); the establishment of an institution for the training of those engaged in optical industries of London to Mr. Chalmers (Sydney); of spectroscopic research to Prof. Duffield (Adelaide); while Gray (Melbourne), Lusby (Sydney), Glasson (Adelaide), Florance (New Zealand), are all contributing researches in physics from various English laboratories. It is to be hoped, he continued, that in the future an increasing amount of such investigations will be carried out in Australasian laboratories, so that these laboratories will come to be generally regarded not merely as places where existing knowledge is expounded, but where new knowledge is obtained, where there flourished an enlightening spirit of investigation. "When our laboratories come to be generally regarded in the light I have described, it can but increase their reputation in all directions and make the community have that confidence in science which is so typical of the German people, and so intimately connected with their unprecedented industrial progress."

In Section B, Prof. Bertram Steele chose for his subject "Inorganic Solvents." He said the solubility of a pure substance depends very obviously on the nature of the solvent. We thought of barium sulphate as being a most insoluble salt, being insoluble in weak or strong acid or alkaline solutions; but it should be borne in mind that all such solutions contained water, and by the substitution of pure sulphuric acid for the water it would be found that a large quantity of barium sulphate could be got into solution. Liquefied ammonia, largely used at present on the commercial scale for the manufacture of ice, was a solvent of quite unique properties, and it has been found that two classes of substances, which from the study of their reactions alone or in water solutions were classified as "acid amides" and ammonium salts, would be regarded to-day as something equivalent to the acids had they been first investigated in liquefied ammonia. All facts pointed to the conclusion that the nature of the solvent plays a most important part in conditioning the behaviour of a given substance in solution. The result of recent work in this field showed that present theories were likely to be

modified, but not discarded, by still further investigations.

In Section C, Prof. Marshall dealt with the "Basin of the Pacific Ocean." There were, he said, various theories as to its origin. It had been suggested that it was the scar left by the moon when it came away from the earth; that the hollow had been actually inherent in the pear-shaped form the earth took on cooling; and that it was a subsidence area which had existed since the Triassic period, that part of the earth's crust having fallen in owing to shrinkage. It had been supposed that a land bridge existed between New Zealand and South America not so long ago, so as to explain the resemblances between the flora and fauna of tropical South America and New Zealand. The differences of opinion as to the age and permanence of the basin were as great as those in regard to its structure. Little certainty can be got at present. Structural, rock, and depth characteristics support the idea that the real boundary of the south-west Pacific passes through New Zealand, Kermadec, Tonga, Fiji, the New Hebrides, the Solomons, and the Admiralty Islands. This supposition practically coincides with biological knowledge as to plant and animal distributions within the area. The land connections or approximation took place, he considered, in late Mesozoic or in the Pleistocene times—probably the latter. The eastern Pacific Islands are different in structure, nature, and origin from the lands on this line, and have been peopled by chance immigrants from them. The keen controversies upon all matters of interest to New Zealand geology are, however, only to be expected. The land is so isolated, and the views of geologists have been largely based upon other countries. But at the next meeting of the congress there should be more knowledge available, for there is at present a movement on foot to make an expedition to all the eastern groups of islands in the Pacific, and to gather material for a better scientific description than there has been so far.

In Section D, Mr. F. M. Bailey gave some notes on indigenous plant life. He dealt interestingly with the longevity of seeds. A great deal depends upon the climate in which the seeds are kept. Seeds near the tropics soon lose their vitality, whereas those in a drier climate retain it for a period extending in many instances over quite a number of years. Mr. Bailey pointed out that the usual method of calculating the age of a tree by the concentric rings could not be relied upon in Queensland, for in some seasons more than one might be formed, while in others one might not be made in one or more years. Reference was made to the tenacity of life among indigenous grasses—a circumstance in which Australia is unique. During certain times of drought trees have been killed, and on digging up one of the supposed dead grasses it showed not a sign of life, but with the advent of rain the whole country, in the course of a few weeks, would be waving with grass, not alone from seed, but from these supposed dead roots. Some interesting remarks were made upon "sports" in plant life, Mr. Bailey, who had had a long experience as a cultivator of plants, expressing the opinion that most of the indigenous plants termed varieties owed their variation to "sporting" rather than to sexual reproduction.

Prof. G. C. Henderson in Section E put forward a "Plea for Colonial Historical Research." The time has now arrived, he said, when the history of the Commonwealth should be undertaken in a systematic and scientific way, and the institutions through which that might be done are the universities. The historical work done in Australian centres is preparatory, and should find its fulfilment in research. The best material for research is now available, and by means of scholarships, and especially open scholarships, the right men can be found. Prof. Henderson said that the only comprehensive history of Australia that was based upon a perusal of original and trustworthy material was vitiated from beginning to end by the author's determination to prove that the aborigines were victimised by rapacious politicians and squatters.

In Section F no presidential address was delivered, as the president, Mr. E. Tregear, was at the last moment unable to leave New Zealand.

Mr. E. W. Fowles, the president of Section G1, gave an address on unemployment. From a mass of theories and discussions, said Mr. Fowles, several principles seemed to rest on solid ground. (1) Every man should be given a chance of employment—but not necessarily continual chances. (2) Sentimental treatment of unemployment is futile; the time has come for scientific handling of the problem. (3) The problem is more than local; it is national. (4) Different conditions obtaining in different countries require different remedies. (5) There is no one cure-all. The theorists who imagine a land tax or any other one reform will automatically eliminate the unemployed have been completely discredited. (6) Although there are special conditions in different localities, the same causes produce the same results the world over. Having thus stated the set principles, the president went on to say that the points still debatable were that every workman has a claim on the State to be provided with work, and that the unemployed are a necessary and permanent factor in our present industrial system. For the purpose of scientific treatment, the unemployed might be divided into two classes, those temporarily without regular employment, and those permanently without regular employment.

The relation of science to the further development of Australian agriculture was dealt with by Mr. W. Angus in Section G2. Mr. Angus commenced by showing the progress made in wheat-growing and stock production in Australia. He pointed out that between the years 1860 and 1868 the increase in area under crop was very large—larger than for the past twenty years. The average yields were quite as good, if not better, than they had been for the last eight years. The development, so far as wheat production was concerned, has been more in the direction of extending the area under crop than in any very marked increase in the yield resulting from improved methods of agriculture. He referred to the introduction of fertilisers and the use of the drill, and the great improvement they have made in the industry. He went on to point out the great need of research work to meet the special problems of this country, and dwelt upon the want of finality under the present separate State systems. Some problems are causing a loss of thousands of pounds from year to year. In the investigation of several of them really good work has been done on individual lines, but it had been left just at a stage in which it is of little practical use to anyone. He then dealt with a number of the more urgent of these problems in regard to which combined action was highly necessary. "Take-All" is rapidly spreading in Australia, and it is most desirable to do something at this stage to check it. "Bitter Pit" in apples, a disease not yet investigated, is causing great loss to the fruit industry, and requires immediate attention.

Referring to "dry-farming," he directed attention to the way the wheat areas are being extended into the country of light rainfall, and said that if the Australian farmer could grow wheat profitably in, say, more than 2,000,000 acres of land in each of the four wheat-growing States, then this is a matter which ought to be taken up without delay, and with some of the spirit and in the business-like manner that practical men and men of science are doing in America.

America has instituted a system of soil surveys, the envy of every progressive agricultural community. That work of this kind should be of value to the Australian producer must be evident to all, and what is most needed before anything is undertaken is an agreement among the States as to a definite system, so that from the commencement they might be working on similar lines.

Among other things needing attention is the work of wheat improvement by selection and cross-breeding. Then there is the investigation of such diseases as "Dry Bible" and red rust in wheat, and the raising of varieties immune from attack. There is also the question of strength in flour, and the fixing of a uniform method of determining same, the process of nitrification under Australian conditions, the arrangement of a more uniform system of experimental work, and the comparison and publication of results, investigation into the quality and composition of surface and artesian waters as regards their suitability or otherwise for irrigation.

What is wanted is not a Royal Commission to report, but a body of trained workers to tackle the matter on

systematic lines. Such action has been taken by organisations similar to theirs—for example, the Agricultural Education Association of Great Britain and the Breeders' Association of America. The opportunity seems a good one for the Australasian Association to associate itself with questions of practical importance to the agricultural industry.

Agriculture has to run upon more scientific lines, and the farmer must be even more of a trained producer than in the past. There must be a change in the relations of the man of science and the farmer. They must become more and more co-workers, and have many more interests in common. Hence there must be some half-way meeting-place, and he could think of no more suitable institution than the experimental farm properly equipped and rightly conducted. These farms should be controlled by trained men. They should also be properly equipped—laboratories, workrooms, special implements, and special conveniences. Mr. Angus suggested the establishment of a Central Research Station on the lines of the great institution at Rothamsted. Failing that, the establishment of a Federal Research Station, properly equipped and staffed by the very best men the Commonwealth could provide, would meet the case.

In Section H, dealing with engineering and architecture, Mr. Elwood Mead, chairman of the Victorian State Rivers and Water Supply Commission, submitted a paper on the conservation of water in Australia. In two-thirds of this continent, said Mr. Mead, it is doubtful, seeing that the average annual rainfall is less than 20 inches, whether, with the most economical usage, enough water can be conserved to permit of all the land being occupied or all the mines worked, and it is certain that wasteful or improvident use will mean that large areas of fertile and fruitful soil must for ever remain barren. The Commonwealth Government should, he said, move in the matter, and if that is not feasible, then there should be concerted action by the States. Among the questions this investigation would deal with were the source, the extent, and the probable permanency of underground supplies. In Queensland alone the wells which tap this underground reservoir have a length of more than 310 miles, and had cost above 2,000,000*l*. Nearly 2000 bores had been sunk there. Prof. Gregory had estimated that in 1903 the wells of New South Wales discharged about 22,000,000 cubic feet a day, and those of Queensland 63,000,000 cubic feet. Since that time the number of wells and the discharge had increased. Much of this water is wasted, the prevailing practice being to allow the water forced to the surface to escape. Consequently there is loss by soakage and evaporation. Seriously, Australia should consider whether it is wise to allow this waste to continue.

That the supply is not unlimited, said Mr. Mead, need not be argued. Not only is it limited, but it is less than will be needed for domestic and stock purposes alone. Artesian supplies could not be expected to provide for it. Just how limited the supply was, and how long the flow would continue, were the vital questions. Should the conclusions of Prof. Gregory be correct, the exhaustion of Australia's underground reservoir was inevitable, and it would go out like a snuffed candle.

The presidential address in Section I was delivered by Dr. W. P. Norris, Commonwealth Director of Quarantine, on "Public Health Ideals." Dr. Norris quoted some striking examples of disasters brought about by man's blind dealings with nature. But this rashness, this capacity for experiment and adventure, is the very essence of progress; and, finding he has suffered, man has sought to know more of the world in which he is placed that he may save himself. As his knowledge gathers in volume and becomes precise and ordered, so the beginnings of sanitary science are reached. Man has already furthered his own evolution considerably, half-unconsciously, and for his personal advantage. Science seeks to discover the all-powerful, the all-mighty, the abiding, the permanent, the eternal, in and behind things. There can be little doubt but that to-day man is within reach of real and abiding knowledge, and that if he but has the will, the earnestness, and high seriousness necessary, he may enter into his kingdom—the Regnum Hominis of which Bacon believed, and of which Ray Lankester has more recently told in his Romanes lecture. Science urges the deliberate assumption of his kingdom by man as an absolute duty, in order that he may make good his position in the kingdom of living things, and avoid the holocausts of the past.

The presidential address in Section J, mental science and education, was delivered by the Rev. E. H. Sugden, who spoke of music as an instrument of education.

The principal resolutions passed by the council of the association were the following:—

Magnetic Observatories.—"In view of the great scientific importance of continuous magnetic observations at selected stations, the council most strongly urges the establishment of magnetic observatories at Perth and Port Darwin, to supplement the long-continued and extremely valuable magnetic work of the Melbourne Observatory. The council learns with gratification that the reduction of the forty years' observations of the Melbourne Observatory is now completed, and would earnestly request that the Victorian Government authorise the printing of the results." The foregoing resolution to be brought to the notice of the Commonwealth, Victorian, and Western Australian Governments.

Seismological Equipment.—"That the council directs the attention of the Governments of Western Australia, South Australia, New South Wales, and Victoria to the desirability of increasing and improving the seismological equipment of their respective observatories, in order to fulfil such modern requirements as are represented, for example, in the first-order seismological station in the St. Ignatius College Observatory at Riverview."

Physical and Chemical Data.—"That a committee, consisting of Prof. Masson, Prof. Warren, Prof. Laby, and Dr. Love as secretary, be appointed to cooperate with the International Commission for the collection and annual publication of all determinations of physical, chemical, crystallographic, and engineering constants, and that a sum of 25*l*. be granted towards the work of the committee."

Meridian Observatory.—"That the Australasian Association for the Advancement of Science respectfully directs the attention of the Government to the following resolution, which was passed at the International Astrographic Conference held in Paris in 1909. This resolution the association most strongly supports." Resolution referred to:—"Considering the very small number of observatories in the southern hemisphere organised for work of high fundamental precision, it is very desirable in the interests of science that a meridian instrument of the most modern type should be installed in Australia."

Teaching of Elementary Geometry.—"That, pursuant to the provisions of the resolution carried in Brisbane with regard to the teaching of elementary geometry, a committee, consisting of Prof. Carslaw, Mr. Lucas, Mr. R. H. Roe, with Mr. P. Board as secretary, with power to add to their number, be appointed to carry out the instruction contained in the last half of the Brisbane resolution."

Yass-Canberra Observatory.—"That the council of the A.S. express its gratification of the action taken by the Commonwealth Government in regard to the creation of an observatory at Yass-Canberra, and would recommend that in order to comply with the request of the International Union for Solar Research, brought before the council at the Brisbane meeting in January, 1909, such observatory be designed to fill, amongst other requirements, those of a solar observatory."

Australian History.—"That in the opinion of this association it is desirable that the governing bodies of the public libraries in Sydney, Melbourne, Adelaide, Brisbane, Perth, and Hobart, should communicate with the Secretary of State for the Colonies, asking that duplicates of the despatches that passed between the Governors of the colonies and the Secretaries of State up to a date fixed upon by the Secretary of State should be placed under their charge, and that a copy of this resolution be forwarded to the secretary of each of the libraries aforementioned."

Australian Aborigines.—"That the general council be requested to communicate with the State Premiers, directing their attention to the advisability of adopting a uniform method of spelling Australian place-names."

"That the system of orthography for native names of

places adopted by the council of the Royal Geographical Society, the Foreign and Colonial Office, the Admiralty, and the War Office be used."

"That an organised scheme for the future of the Australian aborigines be formulated and submitted for the consideration of the Federal and State Governments, and that the following be a committee to collect evidence, draw up and submit a proposed scheme to aid these authorities in the event of their consenting to take up the question, and that such scheme receive the support of the association:—Prof. J. Wilson, Dr. Norris, Prof. Baldwin Spencer, Prof. Stirling (Adelaide), Mr. Gillen, Rev. Dr. G. Brown, Archdeacon Lefroy, Dr. Cleland, with power to add to their number."

Anthropometric Tests.—"(1) This section recommends that all anthropometric measurements under the control of the Australasian Governments be based on the schedule of the British Anthropometric Committee. (2) That the advantage of utilising for this purpose the existing machinery for medical inspection of school children in the various States, and of the compulsory cadet service of the Commonwealth, be urged on the authorities concerned. (3) That a committee, consisting of Profs. Masson, Lyle, and Osborne, Drs. Norris and Harvey Sutton, Mr. Tate, Colonel Watson, and the Public Works Architect, be appointed to investigate the subject of ventilation in buildings, and that the committee be asked to present a report to the next meeting (Melbourne)."

General Recommendation.—"That the president of the association be requested to communicate with the Prime Minister of the Dominion of New Zealand, and place before him the desirability of proceeding with the work of describing and publishing the results of the examination of the collection of fossils made by the officers of the Geological Survey of New Zealand, and deposited in the Dominion Museum, Wellington."

"That it is important in the interests of higher education that additional university teaching should be provided in the department of philosophy, more especially in the subjects of sociology and experimental psychology."

"That a time limit be set for authors of papers read before the association, which shall not be exceeded except by special arrangement made beforehand with the sectional committee."

"That a general discussion on 'The Eucalypts and their Products' be brought forward at the Melbourne meeting."

Geophysical Observatory at Barren Jack.—The sum of 50*l.* was voted to assist in defraying the expense of establishing a geophysical observatory near Barren Jack reservoir, for the purpose of attempting to measure the amount of earth tilt under load.

Survey Work around New Zealand.—"That, in the opinion of the Australasian Association, the investigation of the continental shelf around New Zealand and the islands of the south of New Zealand is a work of pressing necessity, both for scientific and for economic reasons; and the association, while recognising the value of the work already done in this direction, would urge upon the New Zealand Government the desirability of taking advantage of the facilities offered by the stay of the Antarctic exploring ship, *Terra Nova*, in New Zealand to complete the survey of the surrounding seas by soundings and dredgings as far as possible."

Protection of Forests.—"That, in view of the vital importance of the conservation of water in Australia by the protection of forests and timber around the sources of its rivers and streams, and which was to have been considered at the present congress, but was deferred until the next meeting in Melbourne, by resolution carried last Monday, it is advisable that a special committee be now appointed to deal with the question in the meantime, and also bring it to the notice of the several Governments of the Commonwealth, in order to prepare the way for a more successful result when dealing with the matter at the Melbourne meeting."

Geological Committees.—(1) A committee to inquire into the question of the classification of the Permo-Carboniferous of Australia, with a view to the revision of the nomenclature. (2) A committee for recording structural features in Australia. (3) A committee to investigate and report on the glacial phenomena in Australasia. (4) A committee to investigate questions of quaternary climate in Australasia. (5) A committee for the investigation of the alkaline rocks of Australasia.

Tidal Survey.—"The Australasian Association for the Advancement of Science at its Sydney meeting in 1911 views with satisfaction the successful establishment by the New Zealand Government of the Tidal Survey, and trusts that at many of the outlying islands automatic tide gauges may be established, and the results systematically analysed. It directs that a copy of this resolution be forwarded to the Prime Minister of New Zealand."

Scientific Literature.—"That a committee be appointed to consider the steps which should be taken with a view to the compilation of a list, as complete as possible, of the scientific serial periodical literature, both in public and private possession in each of the principal centres of Australia."

The council passed the following resolutions with regard to Antarctic exploration:—"This committee recommends that the sum of 1000*l.* be paid from the funds of the association towards the expenses of the proposed Antarctic expedition, on the following conditions:—

"(1) That the expedition be under the supreme command of Dr. Mawson, free from control by any authority outside Australia.

"(2) That the details of the scientific work and the appointment of the members of the expedition be placed in the hands of a special committee of the association, such committee to have full power, subject to the approval of the leader of the expedition. But this condition shall be open to modification after consultation with the Commonwealth Government.

"(3) That Sir E. Shackleton's full consent to the first condition be first obtained.

"(4) That the sum subscribed be spent upon instruments, which shall become the property of the association on the conclusion of the expedition."

The Governor, Lord Chelmsford, gave a garden-party at Government House, Rose Bay. The association received similar hospitality from Miss Macdonald, principal of the Women's College.

The president of St. Ignatius College, Riverview, invited the members of Sections A and C to visit the college to inspect the fine seismological observatory installed at the college. Other invitations were received from various engineering departments of the State. Dr. Harvey Sutton, of Melbourne, gave a demonstration showing how to make and to throw boomerangs.

Prof. T. W. Edgeworth David was unanimously elected president for the next meeting of the association, which will be held in Melbourne in 1913.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

THE thirty-eighth annual dinner of the old students of the Royal School of Mines will be held on Thursday, May 4, at the Café Monico, Piccadilly Circus, W. The chair will be taken by Sir Thomas H. Holland, K.C.S.I., F.R.S. Tickets may be obtained from the hon. secretary, Mr. Arthur C. Claudet, 6 and 7 Coleman Street, London, E.C.

ON Tuesday, April 25, at 10 a.m., Mr. Clifford Dobell will commence a series of twenty lectures on the structure and life-history of the Protista (Protozoa and Protophyta) in the zoological department of the Imperial College of Science. The lectures will be given on Tuesdays and Thursdays at 10 a.m., and will be followed by practical work on Wednesday, April 26, at 5 p.m. Prof. E. W. MacBride, F.R.S., will begin a course of sixteen lectures on "Experimental Embryology." These lectures will be given on Wednesdays and Fridays at 5 p.m., in the zoological department of the Imperial College. Practical work in connection with the lectures will be given twice a week, at times to be arranged. Both Prof. MacBride's and Mr. Dobell's lectures are free to the public.

IN *The School Review* for April a report appears of a lecture by the superintendent of schools at Munich, Dr.